PATENT ABSTRACTS OF JAPAN

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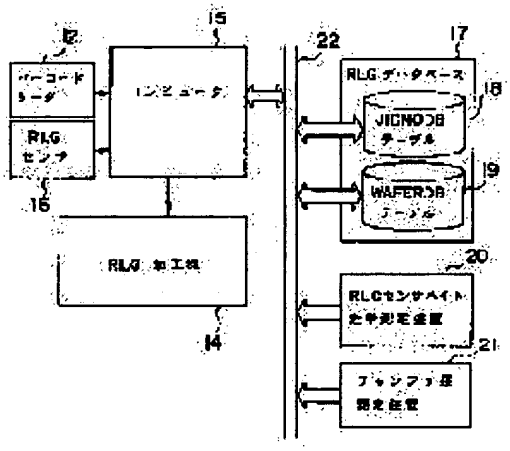
(54) MANUFACTURING METHOD AND MANUFACTURING SYSTEM FOR THIN FILM MAGNETIC HEAD

(57)Abstract:
PROBLEM TO BE SOLVED: To shorten the dwell time between working processes and to enhance an yield by providing a process obtaining a bar in which plural thin film magnetic head sliders are continuously joined by cutting wafers and a process which identifies bars to be worked and works the bars by fetching data in a bar unit, based on the identified results.
SOLUTION: Resistance data from an RLG(resistance lapping guide) sensor 16 and height data from an optical measurement device 20 which are different in every bar are registered in a WAFERDB table 19 together with working target values in a wafer stage in order to make the characteristic of a magnetic- resistance-effect head element optimum. Moreover, wafer numbers, bar numbers and working jig numbers are contrasted and registered in a JIGNODB 18. A computer 15 controls an RLG working machine 14 by reading a working jig which is being fitted to the RLG working machine 14 with a barcode reader 12 and by calculating a primary working time and a secondary working time based on a measured data by a chamfer length measuring device 21 and a data from a database 17.



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* NOTICES *

CLAIMS

[Claim(s)]
[Claim 1] The process which obtains the bar which cut the wafer and two or more thin film magnetic-head sliders connected, It is the manufacture approach of the thin film magnetic head including at least one processing process of processing it about this profit **** each bar. said at least one processing process The manufacture approach of the thin film magnetic head characterized by including the process which identifies, takes out data per bar and processes them based on the identified this result about the bar which should be processed.
[Claim 2] The ejection of said data is the manufacture approach according to claim 1 characterized by performing data using the table stored possible [retrieval] in a bar unit.
[Claim 3] Discernment of said bar which should be processed is the manufacture approach according to claim 1 or 2 characterized by carrying out by identifying the fixture with which this bar is attached.
[Claim 4] Discernment of said bar is the manufacture approach according to claim 3 characterized by carrying out using the contrast table of the delimiter of each bar, and the delimiter of the fixture with which this each bar is attached.
[Claim 5] Discernment of said fixture is the manufacture approach according to claim 3 or 4 characterized by carrying out by the bar code prepared in this fixture.
[Claim 6] It is the manufacture approach given in any 1 term of claims 1-5 characterized by for said at least one processing process including the height control process of grinding the surfacing side of a thin film magnetic-head slider, and adjusting the property of a magnetic-head component, and said data containing the data used at this height control process.
[Claim 7] It is the manufacture approach according to claim 6 characterized by for said height control process to include the process which compares the process which measures the resistance which changes according to polish, and the count process which calculates the height currently ground based on the resistance acquired by this measurement with the height obtained by this count and desired value, and for said data to contain the data used at said count process.
[Claim 8] It is the manufacture approach given in any 1 term of claims 1-7 characterized by for said at least one processing process including the taper-rolling process which grinds the taper section of a thin film magnetic-head slider, and said data containing the data about the chamfer length used at this taper-rolling process.
[Claim 9] the manufacturing system of the thin film magnetic head characterize by to be constitute so that it have a means obtain the bar which cut the wafer and two or more thin film magnetic head sliders connected , and at least one processing means process it about profit **** each of this bar , one processing means identify about the bar which should process even if this ** cannot be find , and data take out per bar and may process based on the result which this identified .
[Claim 10] Said at least one processing means is a system according to claim 9 characterized by having the table which stores the data used for processing possible [retrieval] in each bar unit.
[Claim 11] Said at least one processing means is a system according to claim 9 or 10 characterized by having a bar discernment means to identify the fixture with which the bar which should be processed is attached and to identify this bar.
[Claim 12] Said bar discernment means is a system according to claim 11 characterized by having the contrast table of the delimiter of each bar, and the delimiter of the fixture with which this each bar is attached.
[Claim 13] Said bar discernment means is a system according to claim 11 or 12 characterized by having a means to identify a fixture by the bar code prepared in this fixture.
[Claim 14] It is a system given in any 1 term of claims 9-13 characterized by for said at least one processing means including the height control means which grinds the surfacing side of a thin film magnetic-head slider, and adjusts the property of a magnetic-head component, and said data containing the data which this height control means uses.
[Claim 15] It is the system according to claim 14 characterized by for said height control means to include a means

compare a measurement means measure the resistance which changes according to polish, and a count means calculate the height currently ground based on the resistance acquired by this measurement means with the height obtained by this count means and desired value, and for said data to contain the data used with said count means.
[Claim 16] It is a system given in any 1 term of claims 9-15 characterized by for said at least one processing means including a taper-rolling means to grind the taper section of a thin film magnetic-head slider, and said data containing the data about the chamfer length used with this taper-rolling means.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the manufacture approach of the thin film magnetic head, and the manufacturing system of this thin film magnetic head.
[0002]
[Description of the Prior Art] When manufacturing the thin film magnetic head, a wafer is cut for every train so that two or more magnetic-head sliders may be connected and may be arranged, and various processing processings are performed about the bar which carried out in this way and was obtained in many cases. When performing such bar processing, it is often required that processing should be performed with reference to the data of the bar proper.
[0003] For example, although adjustment of the height (MR height) of an MR head component surely performed is performed by polishing the surfacing side (ABS side) of each bar when manufacturing the thin film magnetic head which has a magneto-resistive effect (MR) head component In this case, in order to make the property of an MR head component the optimal, According to the electric signal from the sensor for polishing control called RLG (Resistance Lapping Guide) or an ELG (Electric Lapping Guide) sensor, while processing current MR height, it calculates. Controlling curve correction of a bar, a polishing processing stop location, etc. is performed. In order to perform such a RLG (or ELG) processing method, the data of bar propers, such as mutually different RLG sensor data for every bar, are needed.
[0004] However, the conventional bar processing method was what indicates the data of a bar proper in the record form which became independent for every wafer, and delivers this to the following process with a wafer (work piece) (for example, refer to JP,9-73615,A).
[0005]
[Problem(s) to be Solved by the Invention] For this reason, the work-piece migration between each bar processing process became a wafer unit, and the trouble that the stagnation time amount between processes increased had arisen. Moreover, since discernment of each bar was performed visually and the bar delimiter etc. was inputted into the processing machine by the manual entry, bar discernment took time and effort and problems -- bar processing which made the mistake in being based on the data of a further different bar is performed -- had arisen.
[0006] Therefore, the purpose of this invention is to offer the manufacture approach of the thin film magnetic head and manufacturing system which can attain shortening of the stagnation time amount between processing processes.
[0007] Bar discernment is certain and easy for other purposes of this invention, and is to offer the manufacture approach of the thin film magnetic head and manufacturing system which can aim at improvement in a shrinkage yield.
[0008]
[Means for Solving the Problem] This invention offers the manufacture approach of the thin film magnetic head including the process which obtains the bar which cut the wafer and two or more thin film magnetic-head sliders connected, and at least one processing process of processing it about each obtained bar. Especially according to this invention, at least one above-mentioned processing process includes the process which identifies, takes out data per bar and processes them based on the identified result about the bar which should be processed.
[0009] Since data are taken out per bar, while also being able to perform the transfer unit within a process per bar, consequently being able to pass a process freely, shortening of the stagnation time amount between processing processes can be attained. And it becomes possible to carry out juxtaposition processing at coincidence about two or more bars obtained from one wafer.
[0010] As for the ejection of data, it is desirable to perform data using the table stored possible [retrieval] in a bar unit.
[0011] As for discernment of the bar which should be processed, it is desirable to carry out by identifying the fixture

with which this bar is attached. Although it is considerably accompanied by difficulty since the delimiter of the discernment from the bar itself is small, it is comparatively easy discernment to identify the fixture itself in which the bar is attached. Therefore, discernment of the bar which should be processed, and un-arranging [for which bar processing which made the mistake in becoming certain and easy and being based on the data of a different bar is performed] are also canceled.

[0012] As for discernment of this bar, it is more desirable to carry out using the contrast table of the delimiter of each bar and the delimiter of the fixture with which each bar is attached. By creating such a contrast table beforehand, it can carry out certainly [bar discernment at each process], and quickly.

[0013] As for discernment of an above-mentioned fixture, it is more desirable to carry out by the bar code prepared in this fixture. If a bar code is used, positive reading will become [rather than] possible using other delimiters.

[0014] At least one processing process mentioned above includes the height control process of adjusting the property of a magnetic-head component by grinding the surfacing side of a thin film magnetic-head slider, for example, controlling MR height or throat height, and, as for the data of an above-mentioned bar unit, it is desirable that the data used at this height control process are included.

[0015] This height control process includes the process which compares the process which measures the resistance which changes according to polish, and the count process which calculates the height currently ground based on the resistance acquired by measurement with the height obtained by count and desired value, and, as for the data of an above-mentioned bar unit, it is desirable that the data used at a count process are included.

[0016] At least one processing process mentioned above includes the taper-rolling process which grinds the taper section of a thin film magnetic-head slider, and, as for the data of an above-mentioned bar unit, it is also desirable that the data about the chamfer length used at this taper-rolling process are included.

[0017] Moreover, this invention offers the manufacturing system of the thin film magnetic head equipped with a means to obtain the bar which cut the wafer and two or more thin film magnetic-head sliders connected, and at least one processing means to process it about each obtained bar. This at least one processing means is constituted so that it identifies, and data may be taken out per bar and may be processed based on the identified result about the bar which should be processed.

[0018] Since data are taken out per bar, while also being able to perform the transfer unit within a process per bar, consequently being able to pass a process freely, shortening of the stagnation time amount between processing processes can be attained. And it becomes possible to carry out juxtaposition processing at coincidence about two or more bars obtained from one wafer.

[0019] As for at least one above-mentioned processing means, it is desirable to have the table which stores the data used for processing possible [retrieval] in each bar unit.

[0020] As for at least one above-mentioned processing means, it is desirable to have a bar discernment means to identify the fixture with which the bar which should be processed is attached and to identify this bar. Although it is considerably accompanied by difficulty since the delimiter of the discernment from the bar itself is small, it is comparatively easy discernment to identify the fixture with which the bar is attached. Therefore, discernment of the bar which should be processed, and un-arranging [for which bar processing which made the mistake in becoming certain and easy and being based on the data of a different bar is performed] are also canceled.

[0021] As for this bar discernment means, it is more desirable to have the contrast table of the delimiter of each bar and the delimiter of the fixture with which each bar is attached. By creating such a contrast table beforehand, it can carry out certainly [bar discernment at each process], and quickly.

[0022] As for the discernment means of an above-mentioned fixture, it is desirable to have a means to identify a fixture by the bar code prepared in the fixture. If a bar code is used, positive reading will become [rather than] possible using other delimiters.

[0023] At least one above-mentioned processing means includes the height control means which adjusts the property of a magnetic-head component by grinding the surfacing side of a thin film magnetic-head slider, for example, controlling MR height or throat height, and, as for the data of an above-mentioned bar unit, it is desirable that the data which a height control means uses are included.

[0024] This height control means includes a means compare a measurement means measure the resistance which changes according to polish, and a count means calculate the height currently ground based on the resistance acquired by this measurement means with the height obtained by this count means and desired value, and, as for the data of an above-mentioned bar unit, it is more desirable that the data used with a count means are included.

[0025] At least one processing means includes a processing means to grind the taper section of a thin film magnetic-head slider, and, as for the data of an above-mentioned bar unit, it is also desirable that the data about the chamfer length

used with a taper-rolling means are included.
[0026]
[Embodiment of the Invention] The operation gestalt of this invention is explained to a detail using a drawing below.
[0027] Drawing 1 is drawing showing roughly the configuration of some RLG processing systems for performing MR height processing and the taper rolling of a thin film magnetic-head slider which have an MR head component as 1 operation gestalt of this invention, and drawing 2 is the block diagram showing the configuration of this operation gestalt.
[0028] The bar which two or more thin film magnetic-head sliders obtained when 10 cut the wafer which is not illustrated in these drawings connected, A bar code reader for the fixture for RLG processing with which, as for 11, the bar 10 was attached, and 12 to read the bar code 13 prepared in the fixture 11, A RLG processing machine for 14 to perform MR height processing, a taper rolling, etc., The personal computer by which 15 is electrically connected to this RLG processing machine 14 and bar code reader 12, Two or more RLG sensors which 16 is prepared on the bar 10 and connected to the computer 15 (sensor for polishing control), The RLG database with which 17 has the fixture number database (JIGNODB) wafer database (WAFERDB) table 18 and 19, and 20 show a RLG sensor height optical measuring unit, and 21 shows the chamfer length measuring device, respectively. The computer 15, the RLG database 17, the RLG sensor height optical measuring unit 20, and the chamfer length measuring device 21 of each other are constituted possible [transmission and reception of data] through the network of LAN22 grade. Although not shown in drawing 2 , two or more connection of the group of a computer 15 and the RLG processing machine 14 may be made at LAN22.
[0029] The fixture 11 is constituted from this operation gestalt by the white ceramic ingredient, and the bar code of the black network showing the fixture number for identifying this fixture itself is formed in that side face of laser beam machining.
[0030] The RLG processing machine 14 performs control of the stop location of MR height (or throat height) processing of a bar 10, correction of the deflection of a bar, processing of the slider taper section, etc. by control of a computer 15, and its configuration of this kind of the processing machine itself is well-known from for example, a U.S. Pat. No. 5620356 official report etc.
[0031] The RLG sensor 16 is formed in MR head component formation and coincidence in a wafer phase, and a part of the planar structures are shown in drawing 3 . This drawing is a top view showing some of MR head component parts and RLG sensor parts of a bar 10. However, this drawing is drawing which looked at a part of layer in fluoroscopy, and in fact, since the inductive head etc. is formed on this, it cannot see these MR head component part and a RLG sensor part from a table.
[0032] In drawing 3 a bar and 10a 10 The ABS side of a bar 10 (field ground), Two MR head components in the MR head component by which two or more formation of 30 and 31 was carried out along with this bar 10 at the single tier, One of two or more RLG sensors formed in the field to which 32 **ed between MR head components at an MR head component and juxtaposition the lead to which 30a and 31a were connected to MR layer of the MR head components 30 and 31, 30b, and 31b list, and 30c and 31c were connected to the both ends of the MR layers 30a and 31a -- the conductor is shown, respectively. moreover, the lead to which 32a was connected to the resistor layer of the RLG sensor 32, and 32b and 32c were connected to the both ends of resistor layer 32a -- it is a conductor. The MR layers 30a and 31a and resistor layer 32a are elongated in parallel with ABS side 10a.
[0033] The JIGNODB table 18 is a contrast table (a fixture number is a search key) on which the bar number which identifies the wafer number and bar 10 which identify a wafer, and the fixture number of the fixture 11 with which the bar 10 is attached contrast, and are registered. The WAFERDB table 19 is the database with which the wafer number was used as the 1st search key, and it used the bar number as the 2nd search key, and is a table registered so that the various data of each bar proper required for processing can take out per bar.
[0034] The RLG sensor height optical measuring unit 20 is equipment which measures optically the RLG sensor height which is not ground in a wafer process, and the RLG sensor height optical measurement data (MSI data are called below) is transmitted to the WAFERDB table 19 in a wafer process through LAN22. The chamfer length measuring device 21 is equipment which measures the chamfer length which is the die length of the taper section of a bar 10, and the measurement data is constituted so that it may be transmitted to a computer 15 through LAN22.
[0035] Drawing 4 is a flow chart which shows roughly the flow of the RLG processing process in this operation gestalt.
[0036] The RLG database 17 is prepared before RLG processing (step S0). Namely, in the wafer phase, the parameter of each bar proper required for count of MR height which calculated beforehand and was obtained from the MSI data obtained from the measurement resistance data and the RLG sensor height optical measuring unit 20 which were obtained from the RLG sensor 16, the processing desired value of MR height, processing specification (error), etc. are

registered into the WAFERDB table 19 for every bar per wafer. Moreover, each bar 10 which carried out cutting separation from the wafer is pasted up on the processing fixture 11, the bar number which identifies the wafer number and bar 10 which identify the wafer, and the fixture number of the fixture 11 which the bar 10 pasted up are contrasted, and it registers with the JIGNODB table 18.
[0037] Calculation of the parameter of each bar proper required for count of MR height registered into the WAFERDB table 19 is explained below.
[0038] As shown in drawing 5 , on one bar 10, a marker 50, two or more MR head components 51 and 52, and 53 .... are formed in seriate, and the 1st RLG sensor 54, the 2nd RLG sensor 55, and the 3rd RLG sensor 56 are formed them and by turns, respectively. The RLG sensor 54 of these 1st, the 2nd RLG sensor 55, and the 3rd RLG sensor 56 have a mutually different pattern, and two or more sets of these groups are formed 12 sets on one bar, for example (in the case of these 12 sets, in the case of 30% shrink, it corresponds). However, the edge 57 of the ABS side side of an MR head component and a RLG sensor and the opposite side has aligned on the same line parallel to ABS side 10a. in addition, although omitted in this drawing, it was shown in these MR head component and the RLG sensor at drawing 3 -- as -- a lead -- the conductor is connected.
[0039] the 1st width of face and height of the RLG sensor 54 -- respectively -- W1 and the H1 (unit is mum) and 2nd width of face and height of the RLG sensor 55 -- respectively -- W1 and (H1-10) the 3rd width of face and height of the RLG sensor 56 -- respectively (W1+10) -- and (H1-10) -- ** -- it carries out. In order to amend the difference of the pattern dimension design value on a mask, and the pattern dimension on an actual bar here, Distance (MSI) with the edge 57 of the opposite side is measured with the RLG sensor height optical measuring unit 20 the ABS side side of the edge 58 by the side of a marker's 50 ABS side, an MR head component, and a RLG sensor. Increase and decrease of the difference of the MSI data and design value (for example, 13 micrometers) which were measured of amendment are carried out to H1 (also for 20 micrometers and W1, a design value is [a design value] 20 micrometers).
[0040] The resistance R1 of the 1st RLG sensor 54, the resistance R2 of the 2nd RLG sensor 55, and resistance R3 of the 3rd RLG sensor 56 It is given by the degree type.
R1 =RI+(C+S-W1)/H1R2 =RI+(C+S-W1)/(H1-10)
R3 =RI+ {C+S-(W1+10)} /(H1-10)
however, RI a lead -- a conductor -- the resistance of a part, the sheet resistance in which S becomes settled by the membraneous quality and thickness of a resistor layer, and C show a resisted part (resistance per unit height) of others, such as for example, crowding resistance.
[0041] These formulas to (C+S-W1) RI R1 And R2 If it asks, it will become like a degree type.
C+S-W1 =-H1 -(H1-10)- (R1-R2) /10RI =R1+(H1-10) - (R1-R2)/10 [0042] H1 amended by MSI data like ****
Measurement resistance data R1 actually measured from the 1st RLG sensor 54 and the 2nd RLG sensor 55 And R2 from -- an upper type -- using -- C+S-W1 And RI It calculates and registers with the WAFERDB table 19 as a parameter of this bar proper.
[0043] A RLG processing process begins from step S1 of drawing 4 in fact. First, the fixture 11 which the bar 10 which should be processed pasted up is attached in the RLG processing machine 14 (step S1). After equipping, the bar code 13 of the fixture 11 is read by the bar code reader 12 (step S2).
[0044] Thereby, a computer 15 gets to know a fixture number from the inputted bar code data, searches the JIGNODB table 18 of the RLG database 17 with the fixture number, and obtains a wafer number and a bar number (step S3).
[0045] Subsequently, the WAFERDB table 19 of the RLG database 17 is searched with this wafer number and a bar number, and the parameter of that bar proper, the processing desired value of MR height, processing specification (error), etc. are taken out (step S4).
[0046] Subsequently, polish of the ABS side by the RLG processing method is started based on this taken-out data (step S5). If it explains in more detail, the MR height HMR at that time will be calculated during polish by repeating and detecting the resistance of a RLG sensor (every [for example,] predetermined time, such as 10 etc. seconds) (step S6), and the deflection of a bar will be corrected that MR height of each part in this bar should be made homogeneity according to that calculated value (step S7). Moreover, polish is stopped when the calculated MR height HMR reaches desired value (step S8 and S9). Measurement resistance data R1 finally obtained after RLG processing termination And R2 is stored in the WAFERDB table 19 (step S10).
[0047] In addition, at this operation gestalt, it is the resistance R1 of the 1st and 2nd RLG sensors 54 and 55. And R2 It detected and calculated and MR height has been obtained. the MR height HMR -- parameter RI of a bar proper And (C+S-W1) and detected resistance data R1 And R2 from -- it is calculated by the degree type.
HMR=(C+S-W1)/(R1-RI) or HMR=(C+S-W1)/(R2-RI)
[0048] Drawing 6 is a flow chart which shows roughly the flow of the taper-rolling process in this operation gestalt, and

expresses the process performed following the RLG processing process of drawing 4 .
[0049] After RLG processing is completed, the primary taper rolling (roughing) of a bar 10 is performed predetermined time, attaching a fixture 11 in the RLG processing machine 14 (step S11).
[0050] Subsequently, a fixture 11 is removed from the RLG processing machine 14, and it attaches in the chamfer length measuring device 21 in order to measure the chamfer length after a primary taper rolling (step S12). After equipping the chamfer length measuring device 21, the bar code 13 of the fixture 11 is read by the bar code reader 12 (step S13).
[0051] Thereby, a computer 15 gets to know a fixture number from the inputted bar code data, searches the JIGNODB table 18 of the RLG database 17 with the fixture number, and obtains a wafer number and a bar number (step S14).
[0052] Subsequently, the WAFERDB table 19 of the RLG database 17 is searched with this wafer number and a bar number, and the value of standard of that bar etc. is taken out (step S15).
[0053] Subsequently, with the chamfer length measuring device 21, chamfer length is measured and the measurement data is stored in the WAFERDB table 19 (step S16).
[0054] Subsequently, a fixture 11 is removed from the chamfer length measuring device 21, and it attaches in the RLG processing machine 14 (step S17). After equipping, the bar code 13 of the fixture 11 is read by the bar code reader 12 (step S18).
[0055] Thereby, a computer 15 gets to know a fixture number from the inputted bar code data, searches the JIGNODB table 18 of the RLG database 17 with the fixture number, and obtains a wafer number and a bar number (step S19).
[0056] Subsequently, the WAFERDB table 19 of the RLG database 17 is searched with this wafer number and a bar number, and the chamfer length measurement data of that bar, a value of standard, etc. are taken out (step S20).
[0057] The time amount which should carry out the secondary taper rolling (precision processing) for making chamfer length into desired value from the obtained chamfer length measurement data, a value of standard, the time amount of a primary taper rolling (roughing), etc. is computed (step S21).
[0058] A secondary taper rolling (precision processing) is performed based on this computed time amount (step S22), and a fixture 11 is removed from the RLG processing machine 14 after termination (step S23).
[0059] As explained above, since the WAFERDB table 19 which stores data possible [retrieval in a bar unit] is used, while also being able to perform the transfer unit within a process per bar, consequently being able to pass a process freely, with this operation gestalt, shortening of the stagnation time amount between processing processes can be attained.
[0060] Moreover, since the discernment for which discernment of the bar 10 which should be processed is attached in this bar 10 is carrying out by identifying the comparatively easy fixture 11, discernment of the bar 10 which should be processed, and un-arranging [for which bar processing which made the mistake in becoming certain and easy and being based on the data of a different bar is performed] are also canceled. Furthermore, since this discernment is performed using the JIGNODB table 18 on which a wafer number and a bar number, and a fixture number contrast, and are registered, it can carry out certainly [bar discernment at each process], and quickly, and activity man days, such as retrieval, are reduced sharply.
[0061] Since the fixture is identified by the bar code, positive reading becomes [rather than] possible further again using other delimiters.
[0062] In addition, it becomes possible about the configuration which connects two or more groups of a computer 15 and the RLG processing machine 14 to the RLG database 17 through the network of LAN22 grade, then two or more bars obtained from one wafer to perform processing processes, such as RLG processing, to coincidence.
[0063] Although data are used per bar in a RLG processing process and a taper-rolling process with the above-mentioned operation gestalt, also in other processing processes or visual-inspection processes other than a processing process (for example, a slider), it is clear that the same effectiveness is acquired with the application of this invention.
[0064] This invention cannot be shown in instantiation, and not all the operation gestalten described above can show it restrictively, and can carry out this invention in other various deformation modes and modification modes. Therefore, the range of this invention is specified by only a claim and its equal range.
[0065]
[Effect of the Invention] Since according to this invention it identifies, and data are taken out per bar and processed based on the identified result about the bar which should be processed as explained to the detail above, while also being able to perform the transfer unit within a process per bar, consequently being able to pass a process freely, shortening of the stagnation time amount between processing processes can be attained. And it becomes possible to carry out juxtaposition processing at coincidence about two or more bars obtained from one wafer.

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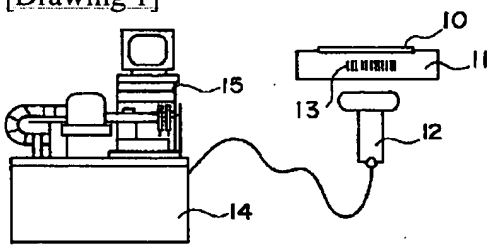
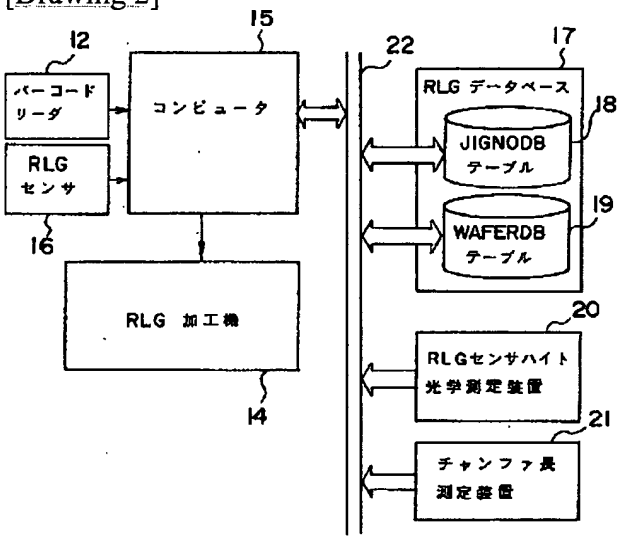
DRAWINGS

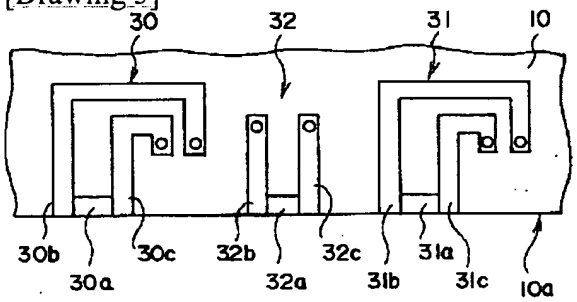
[Drawing 1]



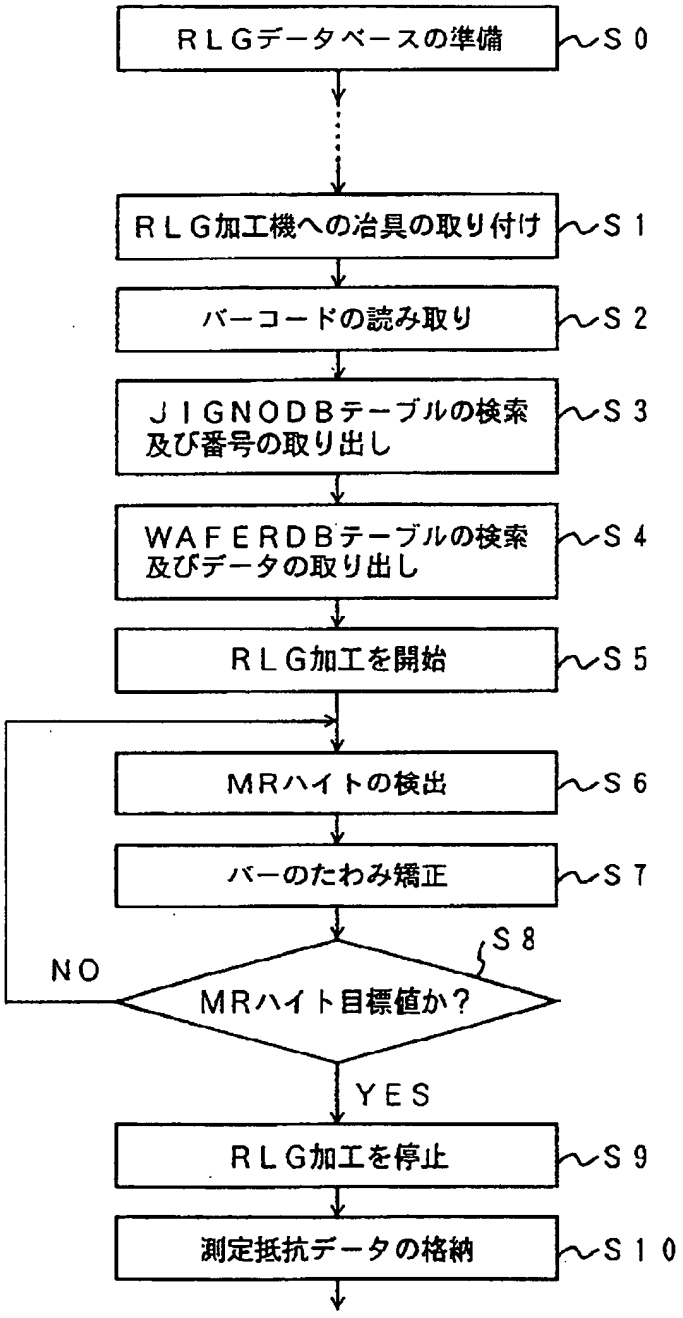
[Drawing 2]



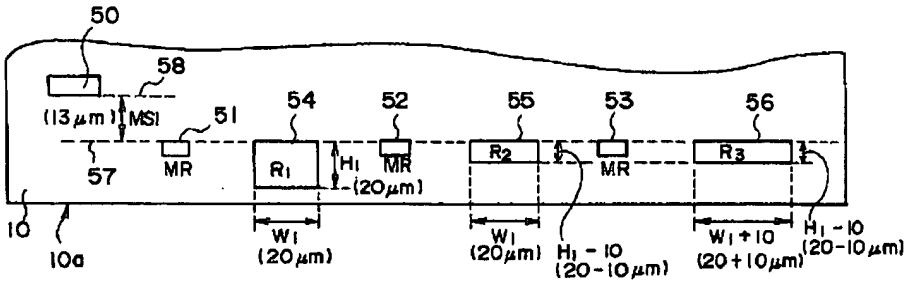
[Drawing 3]



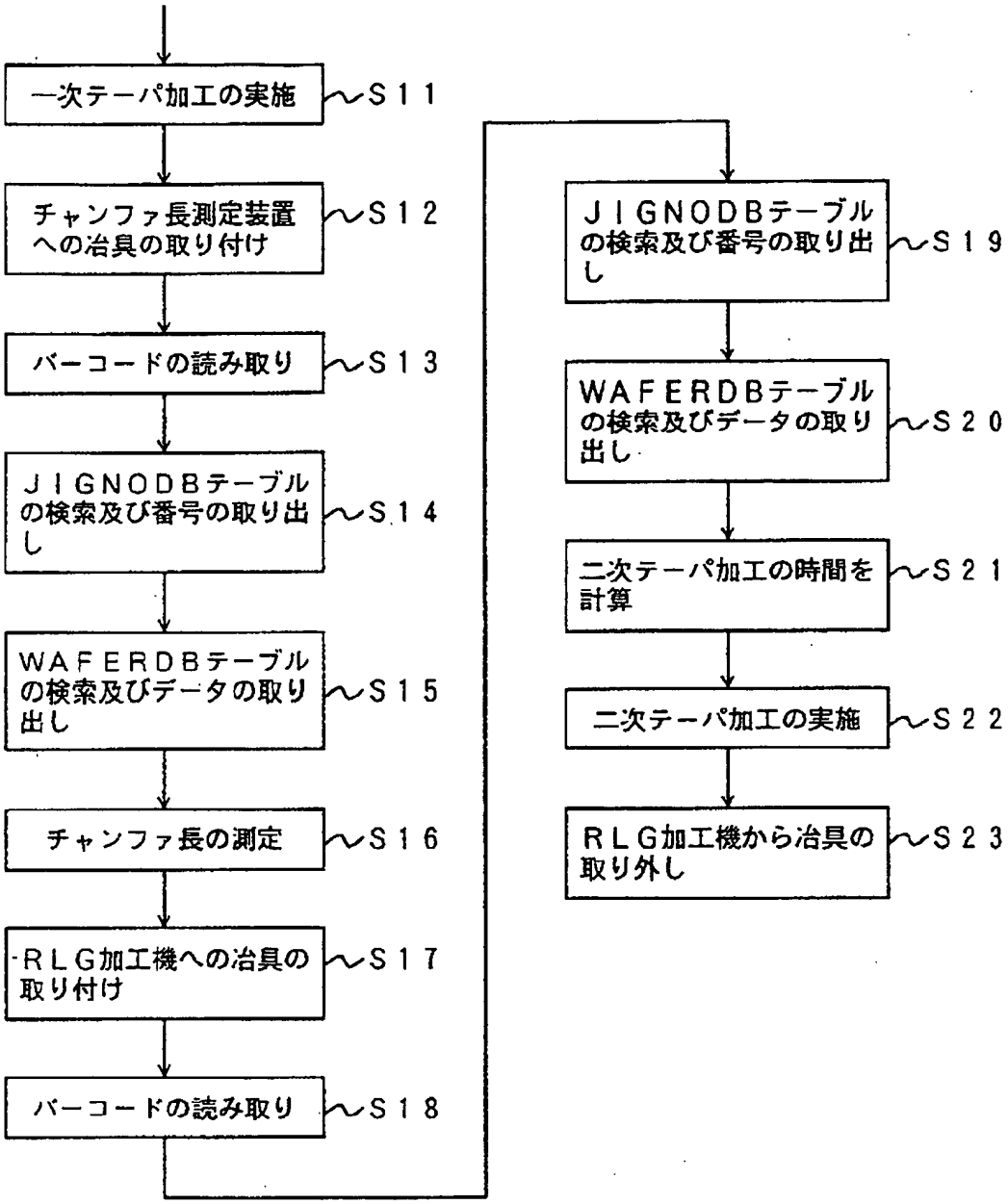
[Drawing 4]



[Drawing 5]



[Drawing 6]



[Translation done.]